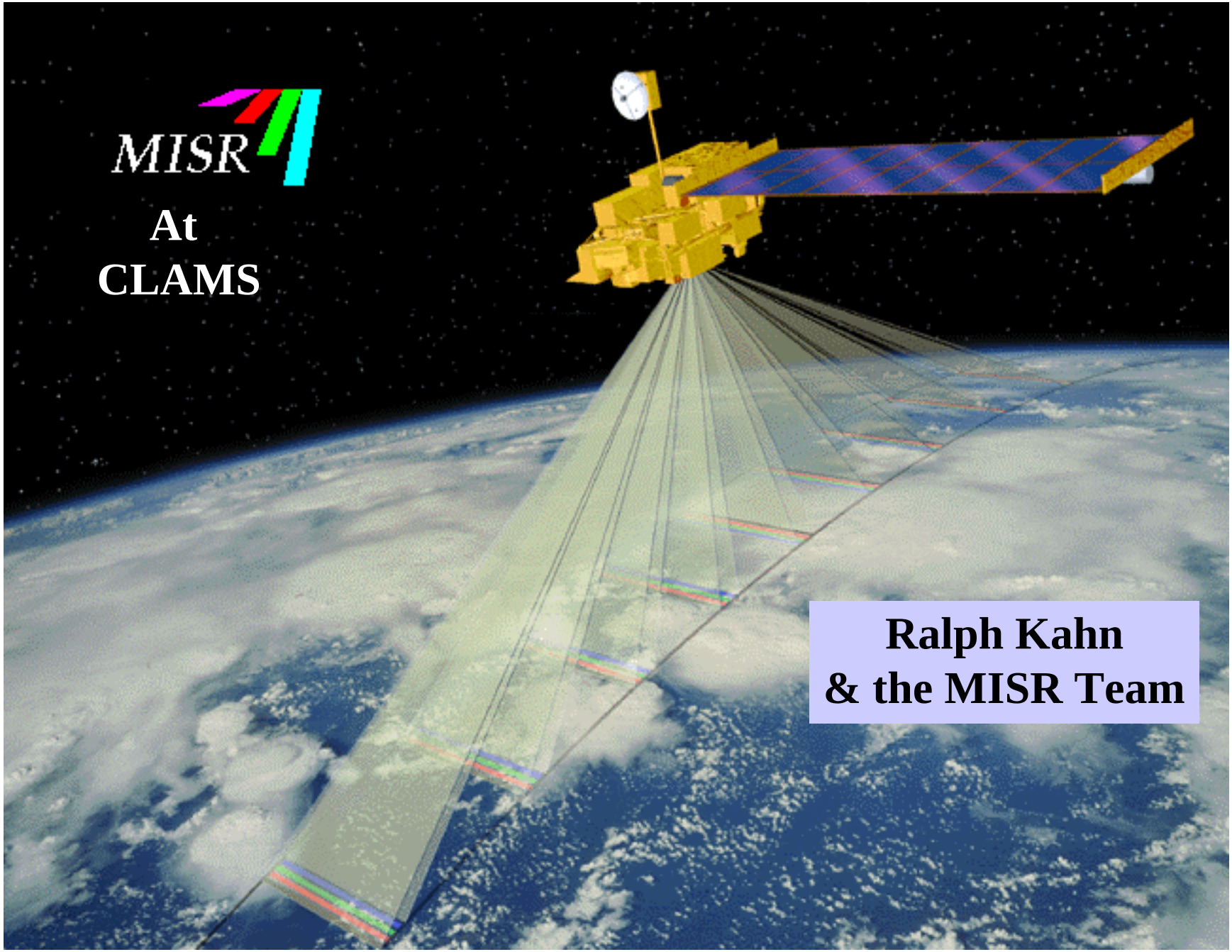
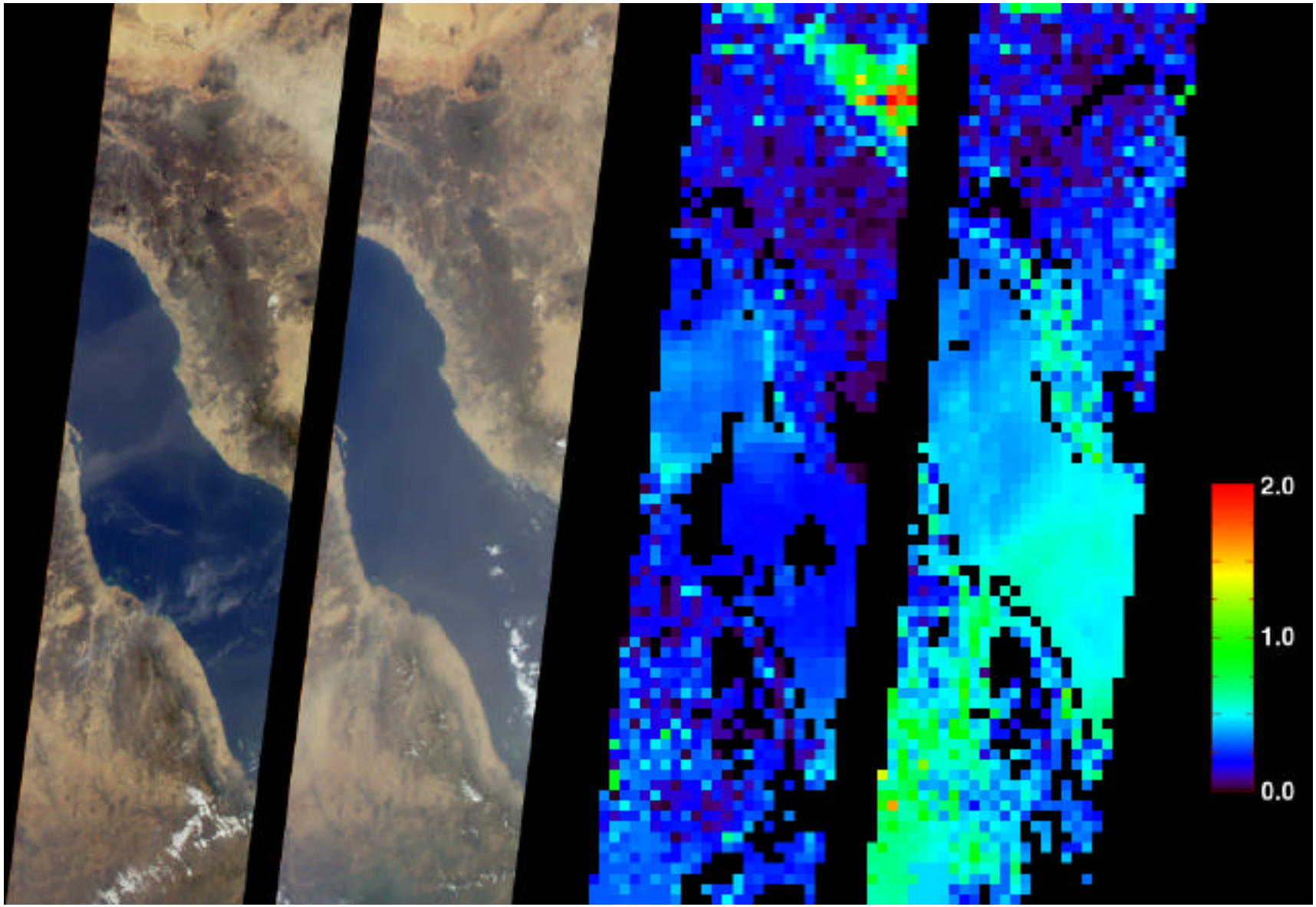

MISR
At
CLAMS
Ralph Kahn
& the MISR Team

MISR Retrieval Examples: Red Sea, 25 March & 29 June 2001



70º-forward images

558-nm aerosol optical depth

The MISR Program for Aerosol Product Intensive Validation

- **Validate MISR Aerosol Retrieval Algorithms**

  Field Campaigns provide some of our **best opportunities to**

  - **Test Our Retrieval Assumptions**

    with the help of the aircraft- and surface-based aerosol observations

  - **Refine Our Algorithms Accordingly**

We Must Address Key Algorithm Assumptions

- Aerosol **Component Particle** Models
- Ocean **Surface** Boundary Condition
- Spatial **Variability** On 100 Meter to 10 Kilometer Scales
- Thin **Cirrus**

We Must Identify Specific Sites where data offer critical tests

The MISR Program for Aerosol Product Intensive Validation (Cont'd)

Constrain Regional Transports and Radiative Forcing

Once we have a Validated Algorithm, MISR will provide over **Entire Regions**, on a **Regular Basis**

- Aerosol Column **Optical Depth**
- A Constraint on Aerosol **Type**

This includes

- **Re-running** MISR data from CLAMS and other Campaigns
- Comparisons with **Transport Models**
- Global **Radiative Forcing** Calculations

MISR Team Goals for Participation in the CLAMS Summer 2001 IFC

1. **MISR Retrieval Validation** -- to test our multi-angle aerosol retrieval approaches over dark water, at least using AirMISR observations, but we hope also with MISR observations.

To meet this goal, we need as close to a "**column closure**" experiment as possible. The aim is to characterize at least one column in as much detail as possible -- aerosol properties, vertical distribution, radiation field, boundary conditions -- coincident with AirMISR (and possibly MISR) overflight, under cloud-free conditions.

We anticipate testing our sensitivity to **maritime aerosol** air masses, possibly **clean continental** or **industrially polluted** aerosol air masses, and **thin cirrus** at COVE.

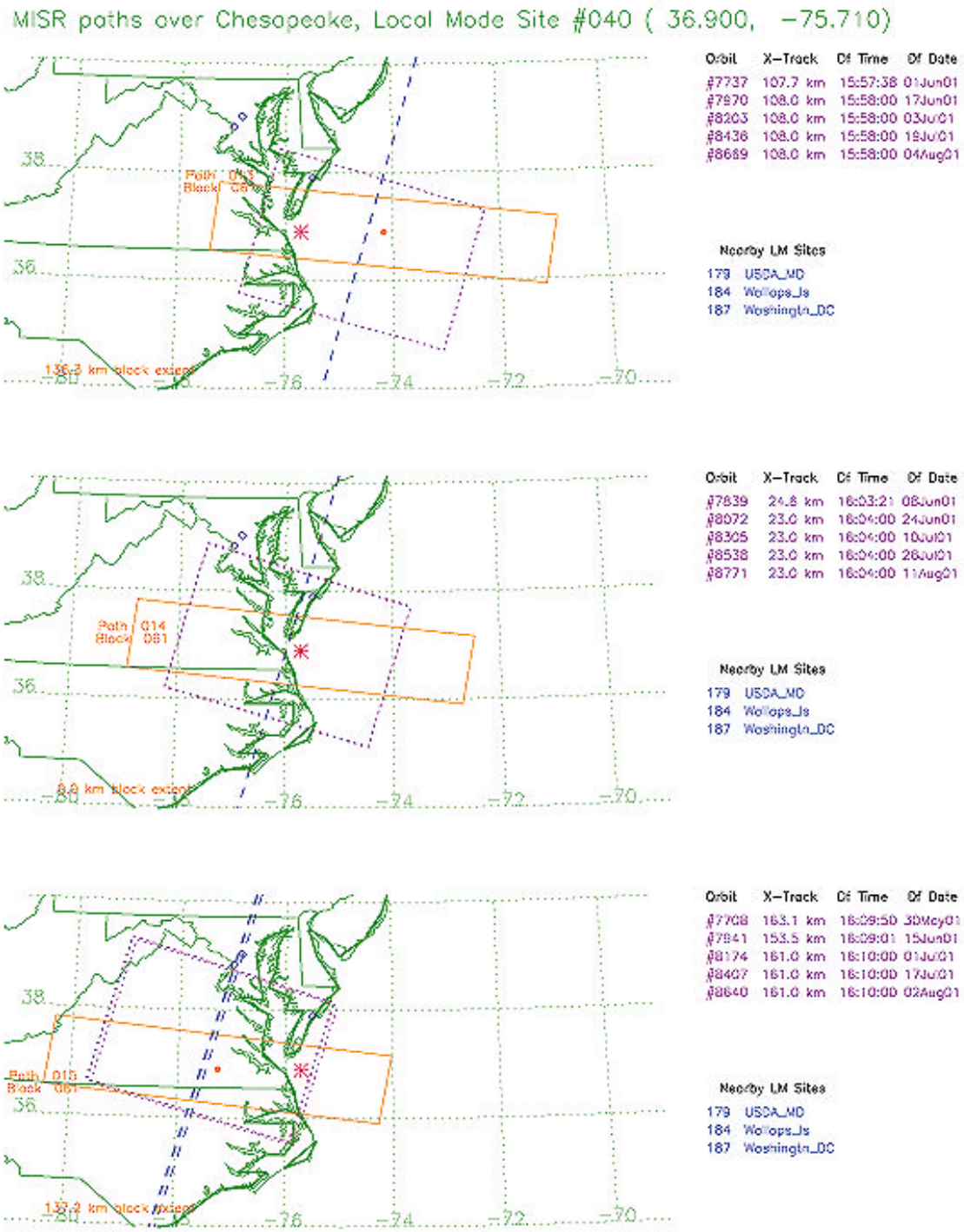
The collection of aircraft and surface instruments involved makes this a unique opportunity to meet one of our key validation goals.

2. **Scene Variability** -- to quantitatively assess the contribution of sub-MISR-pixel scene variability to aerosol measurement uncertainty over dark water.

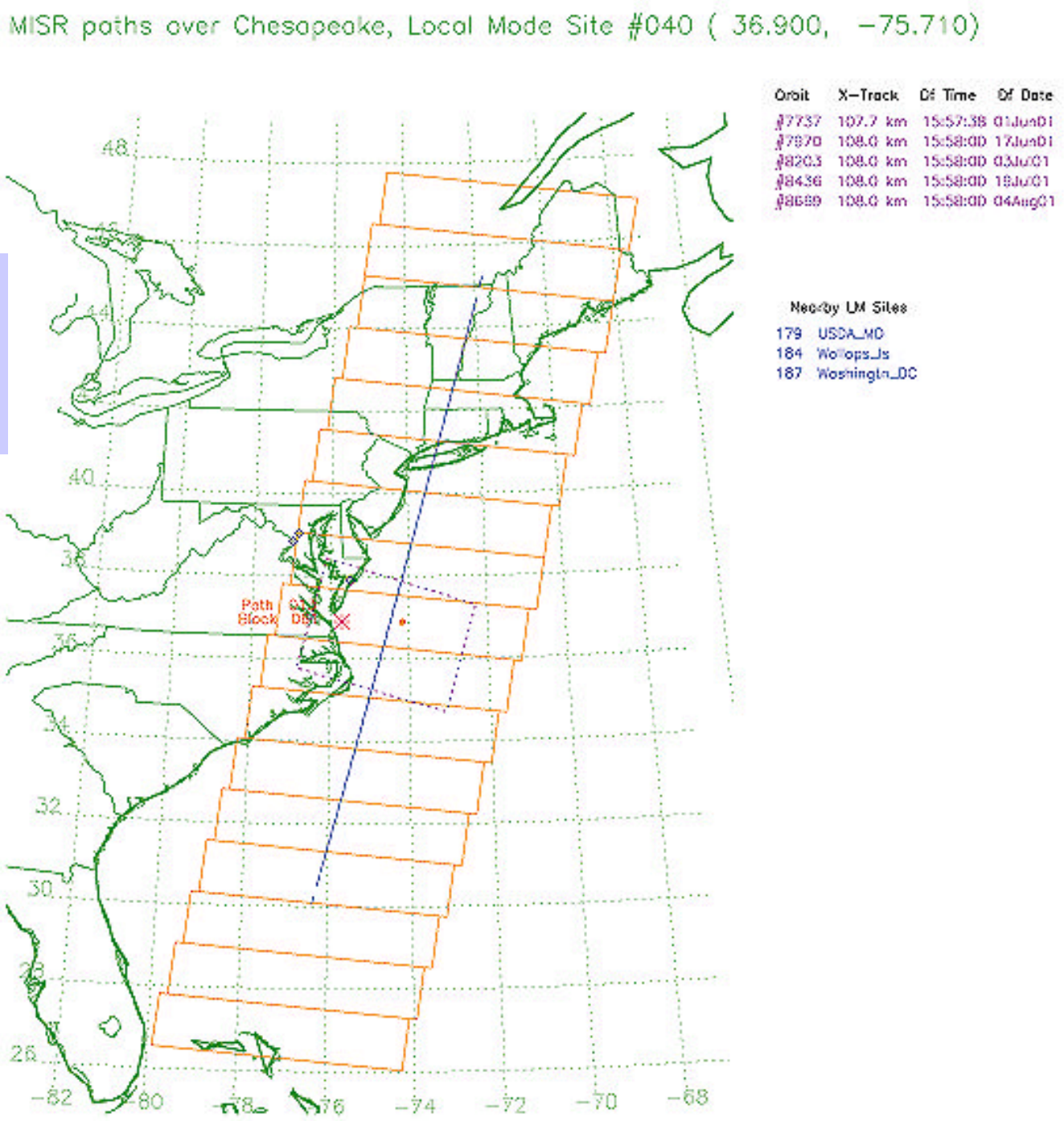
To meet this goal, we need a "**Volume Closure**" experiment, with **both MISR and AirMISR** observing the region under cloud-free conditions. At the same time, the aggregate of surface and aircraft platforms have to do the best job they can characterizing the spatial variability of the surface BRDF and atmospheric gas and aerosols, on one-to-ten-kilometer scales.

Since there is **only about a 1 in 3 chance of cloud-free conditions** for a MISR overpass during the Summer 2001 IFC, it is less likely we will meet this goal. We may reassess our options for meeting this goal next year.

MISR Local Mode Regions for CLAMS



MISR Orbit Track for Path 14



MISR coverage During the CLAMS Campaign
July 10- August 1, 2001

Date	UTC	Target	Orbit	Path
July 10 2001	191_16:06	Chesapeake	8305	14
July 17 2001	198_16:12	Chesapeake	8407	15
July 19 2001	200_16:00	Chesapeake	8436	13
July 26 2001	207_16:06	Chesapeake	8538	14
Aug 2 2001	214_16:12	Chesapeake	8640	15
Aug 4 2001	216_16:00	Chesapeake	8669	13

...of which, Path 15 is less good than 13 and 14

MISR and AirMISR at CLAMS

	AirMISR	MISR
Platform	ER2 Aircraft	Terra Satellite
Elevation	20 km	704 km
Angular Coverage	{±70.5, ±60˚, ±45.6˚, ±26.1˚, nadir}	same
Spectral Channels	{446, 558, 672, 867 nm}	same
Pixel Resolution	27.5 m	275 m
9-Angle Coverage	11 x 9 km Patch	360-km Swath
Observing Method	1 Pivoting Camera	9 Cameras

AirMISR acquires 9 images over the range of angles in a **12-min**, **147-km** ER-2 flight line.

MISR acquires 9 images of a 360-km swath over a period of **7 minutes**, about **once per week** at COVE.

MISR CLAMS Validation Days

[ALL MISR Results are as yet Preliminary – **UNVALIDATED**]

July 10 -- Chesapeake Lighthouse, Orbit 8305, 16:02:32 UTC

Cloud-free day; CV-580 deployed 3 hrs. after MISR overflight.
MISR – **Industrial Maritime** (80% medium, 10% large, 10% BC), Tau = 0.272

July 12 -- Chesapeake Lighthouse, AirMISR only

Cloud-free run with **AirMISR** over Lighthouse, and simultaneously, CV-580

**July 17 -- Chesapeake Lighthouse, Orbit 8407, 16:08:37 UTC

Golden Day – 5 instrumented aircraft, including ER-2 carrying **AirMISR**, stacked over Lighthouse at MISR pass
MISR – **Clean Maritime** (70% medium; 15% large; 15% very large), Tau = 0.443

July 26 -- Chesapeake Lighthouse, Orbit 8538, 16:02:29 UTC

Cloudy day – MISR overflew with CV-580 in a "clear" patch east of Lighthouse
MISR – **Clean Maritime** (70% medium; 15% large; 15% very large), Tau = 0.535

July 31 -- Chesapeake Lighthouse, AirMISR only

AirMISR flew star patterns over deep water buoy as other aircraft measured BRDF

**Aug. 02 -- Chesapeake Lighthouse, Orbit 8640, 16:08:28 UTC

Golden Day – During **MISR** pass, **AirMISR** and CV-580 overflew Lighthouse

CLAMS: Orbit 8305, Block 61
July 10, 2001
MISR Level 1B2 ELLIPSOID RGB AN

(37.58N, 76.62W) (37.39N, 74.75W)

(36.36N, 76.81W) (36.18N, 74.97W)

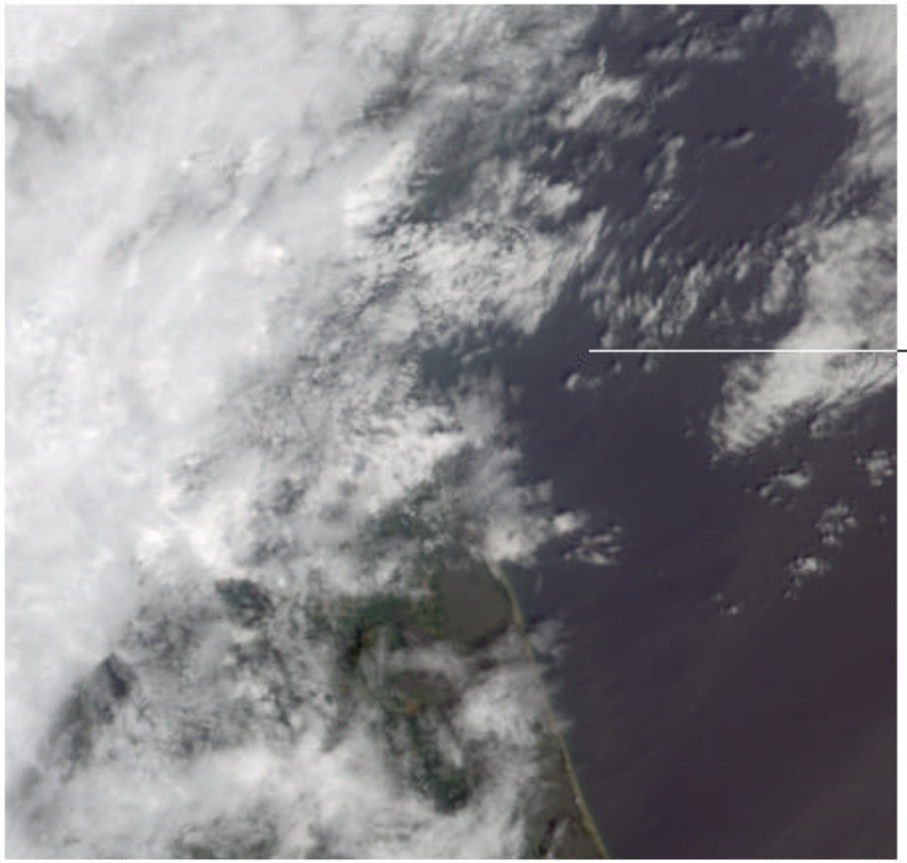
CLAMS: Orbit 8407, Block 61
July 17, 2001
MISR Level 1B2 ELLIPSOID RGB AN

(37.32N, 76.73W) (37.18N, 75.45W)

(36.22N, 76.91W) (36.08N, 75.65W)

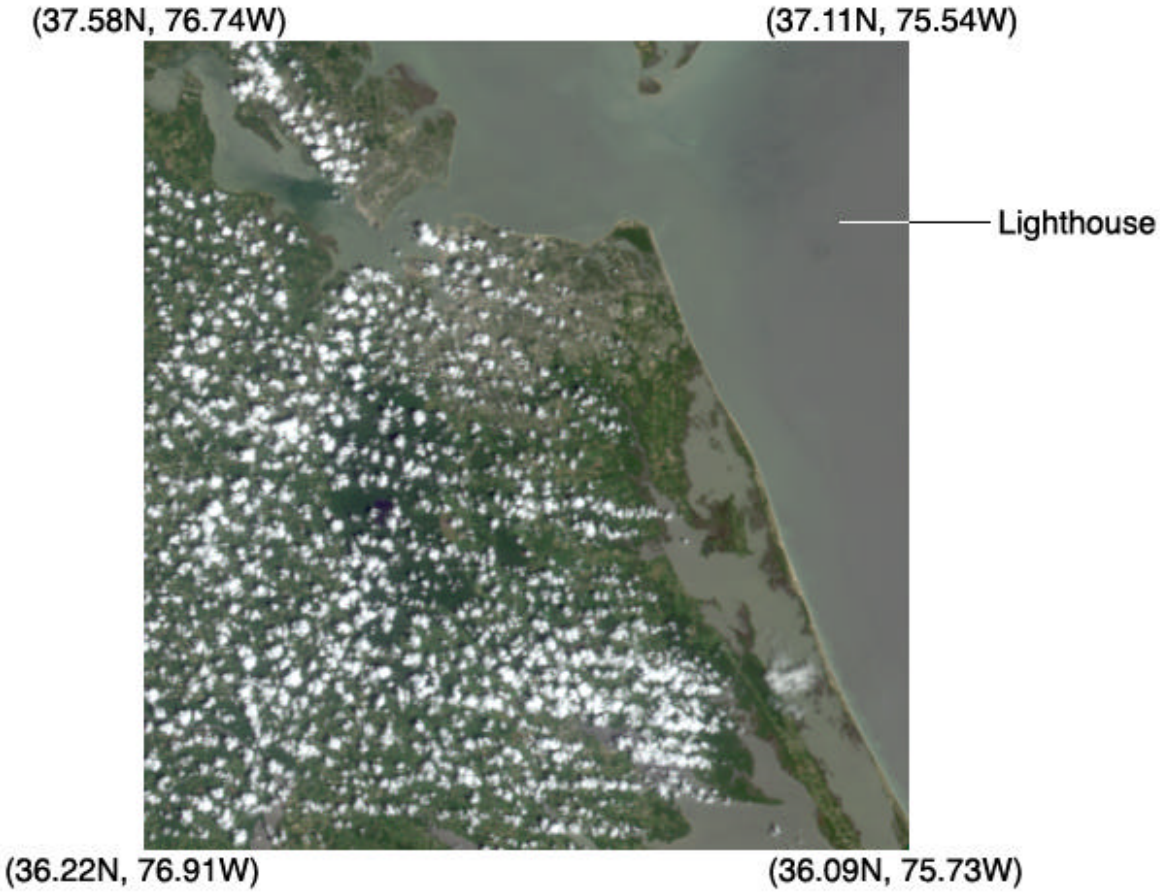
CLAMS: Orbit 8538, Block 61
July 26, 2001
MISR Level 1B2 ELLIPSOID RGB AN

(37.42N, 76.55W) (37.28N, 75.17W)

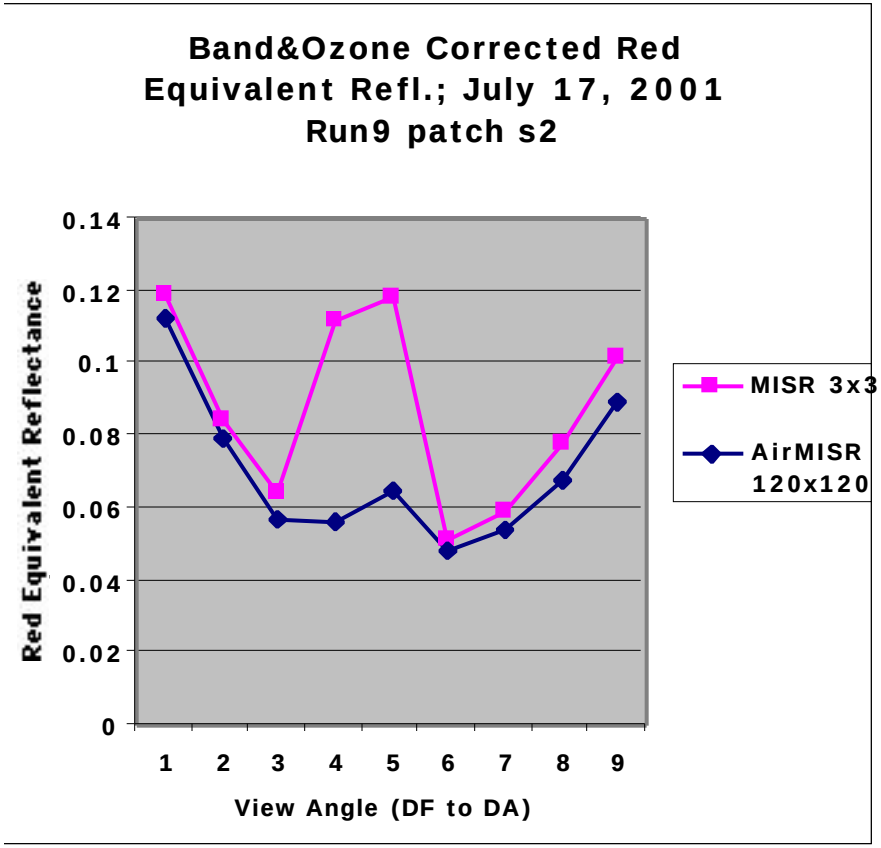


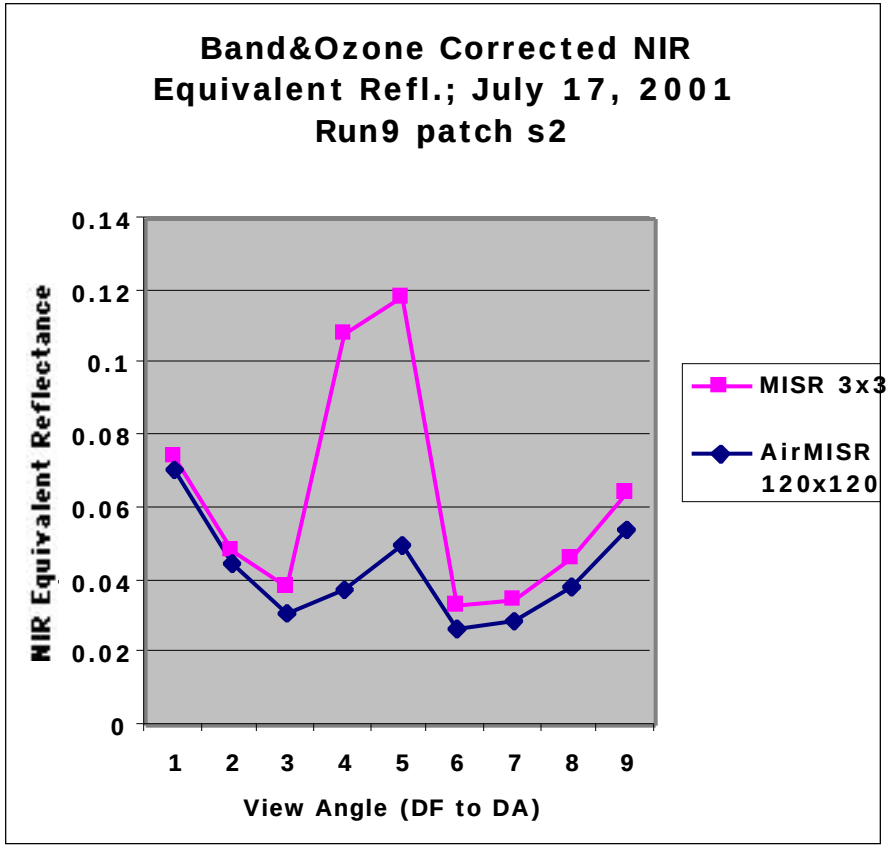
(36.35N, 76.70W) (36.22N, 75.34W)

CLAMS: Orbit 8640, Block 61
August 2, 2001
MISR Level 1B2 ELLIPSOID RGB AN



MISR Dark Water Calibration Using CLAMS AirMISR Data





MISR dark scene calibration exercise using coincident MISR and AirMISR data over ocean near the Chesapeake Lighthouse during the CLAMS field campaign. Such data were taken on a high-aerosol-optical-depth day (July 17, 2001, shown above), when mid-visible optical depths were on order 0.5, an on August 2, 2001, when the mid-visible aerosol optical depth was about 0.15. Excluding the cameras affected by sun glint (3, 4, 5, and in the NIR, 6 for the cases shown above), the MISR data was systematically brighter than AirMISR on both days. The discrepancies are between 5% and 8%. This was traced to ghosting in the MISR optics, which affects the brightness of dark targets (such as ocean) in scenes that also contain bright features (land, sea ice, clouds). The MISR Team is working to develop and implement corrections.

Correlative Ocean Surface Measurements Made During CLAMS

Date	MISR Time†	AirMISR Time†	CAR Time†	Site
7/10	16:02	--	18:12*	COVE
7/12	--	15:37	12:21	COVE
7/17	16:08	16:02	16:57	COVE
7/31	--	15:44-16:43 (star)	16:59	Near buoy 44004
8/2	16:08	16:02	20:10**	COVE

*CV-580 takeoff delayed 3 hours waiting for clearance from LaRC safety officer.

**CAR door stuck closed during MISR overflight.

† Times are UTC.

CLAMS Field Validation Campaign

MISR

AirMISR (ER-2)

Chesapeake Lighthouse, VA, July 17, 2001